

WHAT IS CLAIMED IS:

1. A dielectric waveguide, comprising:
a first single crystal magnesium oxide block having a surface of the face (001), (100) or (010);
and
a first copper oxide superconducting film formed on said surface in a c-axis crystal orientation perpendicular to the surface.
2. The dielectric waveguide according to claim 1, further comprising:
a second single crystal magnesium oxide block having a surface of the face (001), (100) or (010);
and
a second copper oxide superconducting film formed on the surface of said second single crystal magnesium oxide block in a c-axis crystal orientation perpendicular to the surface,
wherein said first single crystal magnesium oxide block has the face (011), (101) or (110) to form a 45 degrees bent structure, and said second copper oxide superconducting film comes in contact with the surface.
3. The dielectric waveguide according to claim 1, wherein said first copper oxide superconducting film is an oxide high-temperature superconductor composed of any one kind or more showing the crystal structure anisotropy of $\text{Bi}_{n1}\text{Sr}_{n2}\text{Ca}_{n3}\text{Cu}_{n4}\text{O}_{n5}$ ($1.8 \leq n1 \leq 2.2$, $1.8 \leq n2 \leq 2.2$, $0.9 \leq n3 \leq 1.2$, $1.8 \leq n4 \leq 2.2$, $7.8 \leq n5 \leq 8.4$),

Pbk1Bik2Sr_{k3}Cak4Cuk5Ok6 ($1.8 \leq k_1 + k_2 \leq 2.2$, $0 \leq k_1 \leq 0.6$, $1.8 \leq k_3 \leq 2.2$, $1.8 \leq k_4 \leq 2.2$, $1.8 \leq k_5 \leq 2.2$, $9.5 \leq k_6 \leq 10.8$), Ym1Bam2Cum3Om4 ($0.5 \leq m_1 \leq 1.2$, $1.8 \leq m_2 \leq 2.2$, $2.5 \leq m_3 \leq 3.5$, $6.6 \leq m_4 \leq 7.0$), REp1Bap2Cup3Op4 (RE: consisting of any of La, Nd, Sm, Eu, Gd, Dy, Ho, Er, Tm, Yb, Lu among rare-earth elements, $0.5 \leq m_1 \leq 1.2$, $1.8 \leq m_2 \leq 2.2$, $2.5 \leq m_3 \leq 3.5$, $6.6 \leq m_4 \leq 7.0$).

4 The dielectric waveguide according to claim 1, further comprising: a protective film containing silver formed on the surface of said first copper oxide superconducting film.

5. The dielectric waveguide according to claim 1, further comprising: a bonding film formed to bond said first copper oxide superconducting film to other members, and consisting of a silver paste or indium containing an organic substance not containing a glass frit, and a silver powder.

6. The dielectric waveguide according to claim 1, further comprising a fixture to fix said first single crystal magnesium oxide block on which said first copper oxide superconducting film is formed, to other members,

wherein the portion to directly bond to said first copper oxide superconducting film is composed of any one or more kinds among Kovar, Invar, sintered magnesium oxide, stabilized zirconia, partially stabilized zirconia, and polytetrafluoroethylene and

ethylene tetrafluoroethylene which are deformable even at 100 K or less.

7. The dielectric waveguide according to claim 1, further comprising a pedestal to fix said first single crystal magnesium oxide block on which said first copper oxide superconducting film is formed.

8. The dielectric waveguide according to claim 7, wherein said first single crystal magnesium oxide block is fixed mechanically on said pedestal.

9. The dielectric waveguide according to claim 2, wherein said first and second copper oxide superconducting films are oxide high-temperature superconductor composed of any one kind or more showing the crystal structure anisotropy of $\text{Bi}_{n1}\text{Sr}_{n2}\text{Ca}_{n3}\text{Cu}_{n4}\text{O}_{n5}$ ($1.8 \leq n1 \leq 2.2$, $1.8 \leq n2 \leq 2.2$, $0.9 \leq n3 \leq 1.2$, $1.8 \leq n4 \leq 2.2$, $7.8 \leq n5 \leq 8.4$), $\text{Pb}_{k1}\text{Bi}_{k2}\text{Sr}_{k3}\text{Ca}_{k4}\text{Cu}_{k5}\text{O}_{k6}$ ($1.8 \leq k1+k2 \leq 2.2$, $0 \leq k1 \leq 0.6$, $1.8 \leq k3 \leq 2.2$, $1.8 \leq k4 \leq 2.2$, $1.8 \leq k5 \leq 2.2$, $9.5 \leq k6 \leq 10.8$), $\text{Y}_{m1}\text{Ba}_{m2}\text{Cu}_{m3}\text{O}_{m4}$ ($0.5 \leq m1 \leq 1.2$, $1.8 \leq m2 \leq 2.2$, $2.5 \leq m3 \leq 3.5$, $6.6 \leq m4 \leq 7.0$), $\text{RE}_{p1}\text{Ba}_{p2}\text{Cu}_{p3}\text{O}_{p4}$ (RE: consisting of any of La, Nd, Sm, Eu, Gd, Dy, Ho, Er, Tm, Yb, Lu among rare-earth elements, $0.5 \leq m1 \leq 1.2$, $1.8 \leq m2 \leq 2.2$, $2.5 \leq m3 \leq 3.5$, $6.6 \leq m4 \leq 7.0$).

10. The dielectric waveguide according to claim 1, further comprising a fixture to fix said first single crystal magnesium oxide block on which said first copper oxide superconducting film is formed, on a pedestal.

11. The dielectric waveguide according to claim 10, wherein said fixture is made of brass.

12. The dielectric waveguide according to claim 11, wherein said pedestal is made of brass.

13. The dielectric waveguide according to claim 12, wherein said fixture is bonded with indium to said first single crystal magnesium oxide block on which said first copper oxide superconducting film is formed.

14. The dielectric waveguide according to claim 13, wherein said fixture is fixed mechanically on said pedestal.

15. The dielectric waveguide according to claim 6, further comprising a pedestal for fixing said first single crystal magnesium oxide block on which said first copper oxide superconducting film is formed, together with said fixture,

wherein the portion to directly bond to said first copper oxide superconducting film is composed of any one or more kinds among Kovar, Invar, sintered magnesium oxide, stabilized zirconia, partially stabilized zirconia, and polytetrafluoroethylene and ethylene tetrafluoroethylene which are deformable even at 100 K or less.

16. The dielectric waveguide according to claim 15, wherein said fixture is fixed mechanically on said pedestal.

17. The dielectric waveguide according to claim 1, further comprising:

a pedestal to fix said first single crystal magnesium oxide block on which said first copper oxide superconducting film is formed; and

a bonding layer to bond said first copper oxide superconducting film to said pedestal.

18. The dielectric waveguide according to claim 17, wherein said bonding layer is a silver paste containing a silver powder and an organic substance which does not contain a glass frit.

19. The dielectric waveguide according to claim 18, wherein said pedestal is a sintered magnesium oxide plate.

20. A method of production for a dielectric waveguide comprising:

a step of preparing to prepare a first single crystal magnesium oxide block having a surface of face (001), (100) or (010); and

a step of forming to form on said surface a first copper oxide superconducting film in a c-axis crystal orientation perpendicular to the surface.

21. The method of production for the dielectric waveguide according to claim 20, wherein said forming step is to form the first copper oxide superconducting film by a sputtering process or a pulse laser deposition process.